

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: To be assigned
Filing Date: Herewith
Applicants: Yoshifumi Okabe et al.
Group Art Unit: To be assigned
Examiner: To be assigned
Title: Semiconductor Device And Method Of Manufacturing Same
Attorney Docket: 4041J-000499/DVE

Director of the United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Pursuant to 37 C.F.R. §§ 1.56, 1.97 and 1.98, Applicant hereby submits an Information Disclosure Statement for consideration by the Examiner.

I. LIST OF PATENTS, PUBLICATIONS, AND OTHER INFORMATION

The patents, publications and other information submitted for consideration by the Office (except unpublished U.S. patent applications) are listed on Form 1449 attached hereto.

II. COPIES

A. ___ Submitted herewith is a legible copy of (i) each U.S. patent application publication and U.S. and foreign patent; (ii) each publication or that portion which caused it to be listed; (iii) for each cited pending U.S. application, the application specification including the claims, and any drawing of the application which caused it to be listed including the claims directed to that portion; and (iv) all other information or that portion which caused it to be listed.

B. X Any patents, publications or other information which are listed on Form 1449 or on the copies of PTO-892, but which are not enclosed herewith, were previously cited by or submitted to the PTO in one of the following applications which has been relied upon for an earlier filing date under 35 U.S.C. § 120:

<u>U.S. Serial Number</u>	
10/283,981	
08/962,322	(USP 6,498,366)
08/409,900	(USP 5,689,130)
07/953,766	(abandoned)
07/652,920	(USP 5,242,862)

<u>U.S. Filing Date</u>
October 30, 2002
October 31, 1997
March 22, 1995
September 30, 1992
February 8, 1991

C. ___ This is a PCT application in the entry of the National Phase in the United States. A copy of the International Search Report is attached for the Examiner's information. The documents listed on the International Search Report are listed on the attached Form-1449 for consideration by the Examiner and for listing on any patent resulting from this application. Since the International Search Report was from the US, EPO, or JPO search authorities, copies of these references should have been supplied to the USPTO under the trilateral agreement and are believed to be in the file of the above-identified application. (MPEP 1893.03(g))

III. CONCISE EXPLANATION OF THE RELEVANCE (check at least one box)

A. ___ Except as may be indicated below in (B), all of the patents, publications or other information are in the English language (concise explanation not required).

B. ___ A concise explanation of the relevance of each patent, publication or other information listed that is not in the English language is as follows (see 37 C.F.R. § 1.98(a)(3)):

1. ___ See the attached foreign patent office communication from a counterpart foreign application:
2. ___ English translations are provided for: *As noted on attached Form 1449*
3. ___ Other:

C. ___ The following additional information is provided for the Examiner's consideration.

IV. CROSS REFERENCE TO RELATED APPLICATION(S)

A. ___ The Examiner is advised that the following co-pending application(s) contain(s) subject matter that may be related to the present application. By bringing this(these) application(s) to the Examiner's attention, Applicant(s) does(do) not waive the confidentiality provisions of 35 U.S.C. § 122.

<u>Serial No.</u>	<u>Filing Date</u>	<u>Art Unit</u>
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V. THIS IDS IS BEING FILED UNDER

A. X 37 C.F.R. § 1.97(b): (check only one box)

1. X within three months of the filing date of a national application other than a continued prosecution application under § 1.53(d) (37 C.F.R. § 1.97(b)(1)). No fee or certification is required.

2. ____ within three months of the date of entry of the national stage as set forth in §1.491 in an international application (37 C.F.R. § 1.97(b)(2)). No fee or certification is required.

3. ____ before the mailing of a first Office Action on the merits (37 C.F.R. § 1.97(b)(3)). No fee or certification is required. In the event that a first Office Action on the merits has been issued, please consider this IDS under 37 C.F.R. § 1.97(c) and see the certification under 37 C.F.R. § 1.97(e) below; or, if no certification has been made, charge our deposit account a fee in the amount of \$180.00 as required by 37 C.F.R. § 1.17(p).

4. ____ before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No fee or certification is required.

B. ____ 37 C.F.R. § 1.97(c): (check only one box)

- before the mailing date of either any Final Office Action under 37 C.F.R. § 1.113, a Notice of Allowance under 37 C.F.R. § 1.311, or an action that otherwise closes prosecution.

1. ____ No certification; therefore, a fee in the amount of \$180.00 is required by 37 C.F.R. § 1.17(p).

2. ____ See the certification below. No fee is required.

C. ____ 37 C.F.R. § 1.97(d):

- after the mailing date of either a Final Office Action under 37 C.F.R. § 1.113 or a Notice of Allowance under 37 C.F.R. § 1.311, yet on or before payment of the issue fee.

1. ____ See the certification below. A fee in the amount of \$180.00 is required by 37 C.F.R. § 1.17(p).

VI. CERTIFICATION UNDER 37 C.F.R. § 1.97(e): (check only one box)

The undersigned hereby certifies that:

A. ____ each item of information contained in this IDS was first cited in a communication from a foreign patent office in a counterpart foreign

application not more than three months prior to the filing of this IDS (See 37 C.F.R. § 1.97(e)(1)). See further statement under 37 C.F. R. 1.704(d) below in section VII, if applicable; or

- B. ☐ no item of information contained in this IDS was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned after making reasonable inquiry, no item of information contained in this IDS was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this IDS (See 37 C.F.R. § 1.97(e)(2)).
- C. ☐ Some of the items of information were first cited in a communication from a foreign patent office. As to this information, the undersigned hereby certifies that each item of information contained in this IDS was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS. As to the remaining information, the undersigned hereby certifies that no item of this remaining information contained in this IDS was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned after making reasonable inquiry, no item of information contained in this IDS was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this IDS.

VII. STATEMENT UNDER 37 CFR 1.704(d)

The undersigned hereby states that:

☐ each item of information contained in this IDS was cited in a communication from a foreign patent office in a counterpart application and this communication was not received by any individual designated in 37 C.F.R. 1.56(c) more than thirty days prior to the filing of this IDS.

VIII. PAYMENT OF FEES (check only one box)

- A. ☐ A check in the amount of \$180.00 is enclosed for the above-identified fee.
- B. ☐ Please charge Deposit Account No. 08-0750 in the amount of \$180.00 for the above-indicated fee. A duplicate copy of this paper is attached.

The above references are being cited only in the interest of candor and without any admission that they constitute statutory prior art, contain matter which anticipates the invention, or which would render the same obvious, either singly or in combination, to a person of ordinary skill in the art. Furthermore, this Information Disclosure Statement shall not be construed as a representation that a search has been made.

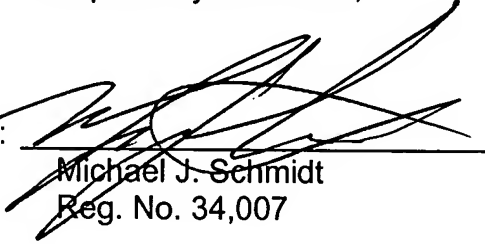
If it is determined that this IDS has been filed under the wrong rule, the PTO is requested to consider this IDS under the proper rule (with a petition if necessary) and charge the appropriate fee to Deposit Account No. 08-0750.

Please charge any additional fees or credit any overpayment pursuant to 37 C.F.R. § 1.16 or § 1.17 to Deposit Account No. 08-0750.

Respectfully submitted,

Dated: August 28, 2003

By:


Michael J. Schmidt
Reg. No. 34,007

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

MJS/lf-s

FORM HDP-1449 (Based on Form PTO-1449)

**PATENT AND TRADEMARK OFFICE
INFORMATION DISCLOSURE CITATION**
(Use several sheets if necessary)

Sheet 1 of 3

ATTORNEY DOCKET No.

4041J-000499DVE

SERIAL No.

To be assigned

APPLICANT

Yoshifuma Okabe et al.

FILING DATE

Herewith

GROUP

To be assigned

U.S. PATENT DOCUMENTS

Ref. Desig.	Examiner's Initials	Document Number	Date	Name	Class/ Subclass	(If appropriate) Filing Date
1.		4,853,345	8/1989	Himelick		
2.		4,879,250	11/1989	Chan		
3.		4,859,629	8/1989	Reardon et al.		
4.		4,927,784	5/1990	Kazior et al.		
5.		4,931,412	6/1990	Fischer et al.		
6.		4,985,740	1/1991	Shenai et al.		
7.		5,241,862	9/1993	Okabe et a.		
8.		5,333,961	8/1994	Lidow et al.		
9.		5,689,130	11/1997	Okabe et al.	252/342	

FOREIGN PATENT DOCUMENTS

Ref. Desig.	Examiner's Initials	Document Number	Date	Country	Class/ Subclass	Translation Yes	No
1.		57-15420	1/1982	JAPAN			
2.		58-45814	10/1993	JAPAN			
3.		59-113629	6/1985	JAPAN			
4.		59-189625	10/1984	JAPAN			
5.		59-213140	12/1984	JAPAN			
6.		59-220937	12/1994	JAPAN			
7.		61-234041	10/1986	JAPAN			
8.		61-296769	12/1986	JAPAN			
9.		62-23170	1/1987	JAPAN			

Examiner:

Date Considered:

EXAMINER: Please initial if citation considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

FORM HDP-1449 (Based on Form PTO-1449) PATENT AND TRADEMARK OFFICE INFORMATION DISCLOSURE CITATION (Use several sheets if necessary) Sheet 2 of 3	ATTORNEY DOCKET No.	SERIAL No.
	4041J-000499DVE	To be assigned
	APPLICANT	
	Yoshifuma Okabe et al.	
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	Herewith	To be assigned

FOREIGN PATENT DOCUMENTS							
Ref. Desig.	Examiner's Initials	Document Number	Date	Country	Class/ Subclass	Translation Yes	No
10.		62-43123	10/1987	JAPAN			
11.		62-243332	10/1987	JAPAN			
12.		62-293678	12/1987	JAPAN			
13.		63-253633	10/1988	JAPAN			
14.		1-169970	7/1989	JAPAN			
15.		57-097630	6/1982	JAPAN			

OTHER DOCUMENTS (including Author, Title, Date, Pertinent Pages, etc.)		
Ref. Desig.	Examiner's Initials	
1.		KRISHINA SHENAI, "Vertical-Power DMOSFET", IEEE Elect. Device Letter, Vol. No. 10, No 3,/1989
2.		Krishnam Shenai, "Optimally Scaled Low-Voltage Vertical Power MOSFET's for High-Frequency Power Conversion", IEEE Trans. of Elect. Device Vol. 37 No. 4,4/1990.
3.		C.Y. Ting et al., "The Use of Titanium-based Contact Barrier Layers in Silicon Technology", Thin Solid Films, 96(1982) 327-345 Electronics and Optics
4.		Semiconducotr Devices-Physics and Technology, Jan. 1985 S.M. Sze page 307
5.		Alvin B. Phillips, "Transistor Engineering and Introduction to Integrated Semiconductor Circuits", page 76
6.		S. Ogawa et al. "HRTEM and Nno-Scale Micro Analysis of Titanium/Silicon Interfacial Reaction Correlated With Electrical Properties, Extended Abstract.
7.		Wolf et al. "Silicon Processing For The VLSI Era, Vol. 1: Process Tech.", Lattice Press, 1986.

Examiner:	Date Considered:
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<p>FORM HDP-1449 (Based on Form PTO-1449)</p> <p>PATENT AND TRADEMARK OFFICE</p> <p>INFORMATION DISCLOSURE CITATION</p> <p>(Use several sheets if necessary)</p> <p>Sheet 3 of 3</p>	ATTORNEY DOCKET No.	SERIAL No.
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	APPLICANT	
	Yoshifuma Okabe et al.	
	FILING DATE	GROUP
	Herewith	To be assigned

OTHER DOCUMENTS (including Author, Title, Date, Pertinent Pages, etc.)		
Ref. Desig.	Examiner's Initials	
8.		K. Shenai et al. "Characteristics of As-Deposited and Sintered Mo/LPCVD W Contacts to as, B, and P Doped Silicon", 1988 Materials Research Sociest, p. 219-224
9.		K. Shenai et al. "Blanket LPCVD Tungsten Silicide Technology for Smart Power Applications", IEEE Electron Device Letters, vol. 10, no 6 1989m p. 270-273.
10.		K. Shenai et al., "High-Performanc Vertical-Power DMOSFET's with Selectively Silicided Gate and Source Regions", IEEE Electron Device Letters, vol. 10, no. 4, 1989,p.153-155
11.		K. Shenai et al. "Selectively Silicided Vertical Power double-diffused metal-oxide semiconductor field effect transisotrs for high-frequency power switching applications", J. Vac. Sci. Tehcnol. B6(6), 1988, p. 1740-1745.
12.		H.R. Chang et al. "Self-Aligned UMOSFET's with a Specific On-Resistance of , IEEE Transactions on Electron Devices, vol. ED-34, no. 11, 1987, p. 2329-2334
13.		K. Shenai et al. "Selectively Silicided Vertical Power DMOSFET's for High-Frequency Power Conversion" Electronics Letters, vol. 25 no. 12, 1989, p. 784-785.
14.		Webster's II New Riverside University Dictionary, 1984, P,549
15.		Semiconductot devices and technology, by S.M. Sze, P.38

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